

ALGEBRA 2 HON

Name: _____

A Finely Crafted O'Brien Unit 5 Test

Calculator Section: You may use a calculator. Show all work and circle your answer. Use your time wisely; you will be able to earn additional credit after the timed portion of the test by completing Supercorrections. When you finish, put away your calculator and you come up to get the non-calculator part- you may continue to work on both sections without your calculator.

1. In the following statements, $a > 0$, $a \neq 1$ and $x > 0$, $y > 0$. Determine whether each is true or false.

a. $\log_a a = 1$

b. $\log_a 1 = a$

c. $\log_a 0 = 1$

d. $\log_a 1 = 0$

e. $\log_a xy = \log_a x + \log_a y$

f. $\log_a (x + y) = \log_a x + \log_a y$

g. $\log_a (x + y) = \log_a x \cdot \log_a y$

h. $\log_a xy = \log_a x \cdot \log_a y$

i. $\log_a x^y = y \log_a x$

j. $\log_a x^y = (\log_a x)^y$

2. Find the smallest value of x for which $3^x \geq 1,000,000$.

3. The number of bacteria B in a culture increases according to the equation $B = B_0 e^{kt}$. There were 400 bacteria at time $t = 0$ and 900 bacteria at time $t = 4$ hours. Will there be 1900 bacteria after 12 hours? If not, how many will there be?

4. At the right is a "solution" to the equation $100 = 18e^{4k}$.

a. Check the answer $k \approx 0.398$ back in the equation $100 = 18e^{4k}$ and show that it doesn't work.

$$100 = 18e^{4k}$$

$$\ln 100 = \ln(18e^{4k})$$

$$\ln 100 = \ln 18 \ln(e^{4k})$$

$$\frac{\ln 100}{\ln 18} = \ln(e^{4k})$$

b. Circle the error in the "solution" and give a correct solution below.

$$\frac{\ln 100}{\ln 18} = 4k$$

$$\frac{\ln 100}{4 \ln 18} = k$$

$$k \approx 0.398$$

5.

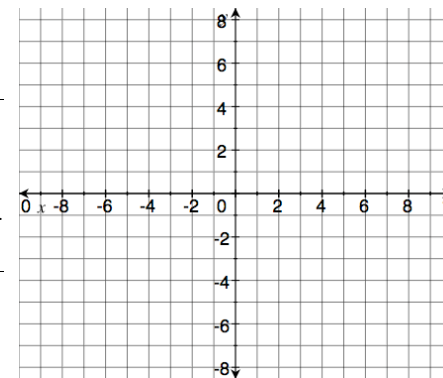
a. Make a table and accurately graph $y = 2^x$.

x							
y							

b. Make a table of values for the inverse of $y = 2^x$.

x							
y							

c. Sketch the graph of the inverse of $y = 2^x$. (Label which graph is which.)



d. Write the equation of the inverse of $y = 2^x$ in $y =$ form.

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Non-calculator

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6. Use the properties of logs to write the expression as a sum, difference, and/or multiple of logs. Simplify where possible.

$$\log \frac{100\sqrt{y}}{x^2}$$

7. Write the expression as the logarithm of a single quantity.

$$\ln 3 + \frac{1}{3} \ln(4 - x^2) - \ln x$$

8. Molly needs to find the range of $f(x) = \frac{e^x + 7}{2}$. She has a brilliant idea that she can use the inverse of $f(x)$ in a clever way to do this. Find $f^{-1}(x)$ and use it to find the range of $f(x)$.

9. Select values for a and b , with $a > b$, such that $\log_b a$ is less than zero. Justify your choice for a and b .

10. Solve for x .

$$\log_a x + \log_a (x - 2) = \log_a (x + 4)$$

11. Given that $\log_a b \approx 2.3219$, approximate

a. $\log_a \frac{1}{b^2}$

b. $\log_b a$

c. $\log_a ab$

12. Solve for x .

$$x^{\frac{3}{4}} = 8$$

13. Suppose $g(x) = \log_7 x$ and $h(x) = 7^x$.

a. Find $g(h(x))$.

b. Find $h(g(x))$.

c. What is the relationship between the functions g and h ?

Bonus: Choose values for a , b , and c so that the equation below is true. Justify your choice of a , b , and c .

$$\log_c [\log_a (\log_b c)] = 0$$